

## CLAIMS

What is claimed is:

Claims 1-6 (canceled)

- 5 Claim 7 (original): I, Gary John Corey, solely invented Multi-Axes Tool Compensation technology based on research I conducted as a CNC machinist.

Claim 8 (canceled)

- 10 Claim 9 (re-presented - formerly claims 1 and 8) A technology element that calculates Multi-Axes Tool Compensation internal to the CNC controller using a provided set of commands. The steps and elements of which comprise:
- 15 a. The user setting his or her preferences for the values or amounts to compensate into boxes on an operator screen, such as the example screen in FIG 1. for the boxes labeled tool size, horizontal offset, vertical offset, tool wear, corner radius, bottom angle, side angle and tool length.
  - 20 b. The user must repeat the steps setting and entering his or her preferences for each tool description. There is no limit to the number of tools, machine types or tool shape combinations to enter.
  - 25 c. An industry standard G Code program as in FIG 9. containing tool positions based on non-compensated original part geometry data, which the Multi-Axes tool compensation calculations are applied. For each multi-axes X,Y,Z,A,B,C value entered in the G Code program, the controller will calculate a compensated value based on the amounts entered into the tool parameter screen as in the example screen in FIG 1.
  - 30 d. A set of commands is provided to override or toggle features on/off and adjust values:
 

35	TOOLCOMP OFF	'Turns all compensation off.
	TOOLCOMP LEFT	'Comps tool in 2D to the left.
	TOOLCOMP RIGHT	'Comps tool in 2D to the right.
	TOOLCOMP 3DCOMP	'3D comp based on vector and gouge parameter.
	TOOLCOMP 3DADJUSTZ	'3D comp lifts Z axis only but keeps X,Y.
	TOOLCOMP 3DOFFSET	'3D parallel offset only - based on vector and
		'no gouge parameter.
40	TOOLCOMP 5AXIS	'5-axis comp based on vector and gouge parameter.
	TOOLCOMP LLIMIT45	'Give angle which will specify a gouge to omit tool.
  - e. A multi-axes tool positioner in a tool holder mounted to a machine's spindle cuts the part as shown in FIG 7. and FIG 8.

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Claim 10 (new) An algorithm element according to claim 9 which does not store or pass the compensated positions by geometry alone but rather expands the intelligence of each calculation for compensated tool positions based on an artificial intelligence algorithm element.

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- a. The artificial intelligence algorithm element is actually a live, real-time, ever-changing database in the machine's memory that remembers by learning from what the machine can and cannot do. The database is an internal list of conditions and positions. The user does not interact with the data in memory.

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Claim 11 (re-presented - formerly claims 2, 3, 4, 5) A Multi-Axes Tool Compensation element according to claim 9 which automatically calculates tool gouge avoidance protection internal to the CNC controller.

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- a. A method for Multi-Axes Tool Compensation which automatically contains algorithms to lift the tool to safe positions or skip the move when necessary by determining if the LLIMIT parameter, as shown in FIG 5. Dim "E" Item 7, is in violation of any surrounding obstacles as determined by a user-defined value.

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- b. A method which allows the machine operator to override the predefined tool characteristics by entering or setting defined values.

- c. A method which does not depend on the programmer to redefine tool position coordinates when the tool characteristics change.

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